1139-13 Clinical Performance of the Wavelet™ Automatic Electrogram Template Collection Algorithm

Steven J. Compton, Jay Merrill, Paul Dorian, Jian Cao, Duo Zhou, Alaska Heart Institute, Anchorage, AK, Medtronic, Inc., Minneapolis, MN

Background: Electrogram morphology (EGM) analysis may improve arrhythmia discrimination in implantable cardioverter-defibrillators, but the EGM may change with lead maturation, drugs or disease progression. We evaluated a novel 3-stage automatic algorithm that collects and confirms the EGM template and then continuously assesses the need for template updating.

Methods: The new algorithm first collects a template from the patient's non-paced, slow rhythm and screens out premature ventricular contractions. Template confirmation requires that ≥ 70 of 100 non-paced beats match the template before it is activated for VT/SVT discrimination (> 12 minutes). Matching of the template and intrinsic EGM is performed using match scores computed using a Wavelet transform-based method described previously. After template activation, a continuous quality check triggers the collection of a new template when fewer than 70 of 100 non-paced beats match the template (> 8 hours). This new algorithm was studied in 50 patients implanted with the Medtronic Marquis VR ICD. Automatic templates were compared with the patient's real-time intrinsic EGM using Wavelet match score evaluation at pre-hospital discharge (PHD) and up to 4 weeks post implant.

Results: All 50 patients had at least one automatic template created and 17 (34%) of those had template updating. The median time to create the first automatic template was 73.6 minutes. The median number of automatic templates was 3 per patient (range 2 – 33). Of the 146 automatic templates compared to intrinsic rhythm, 139 (95.2%) had a median match score ≥ 70% (2 to 25 beats). Intrinsic rhythm at one month had significantly higher match scores with automatic templates (88.4±8.2%) than with manual templates generated at PHD (83.4±11.3%) (P <0.05) or with automatic templates created at implant (81.9±10.6%) (P<0.001).

Conclusion: Changes in EGM morphology over time were observed, thus documenting the need for automatic template updating. The new automatic template collection algorithm operated properly in all patients.

1139-14 Smoking Is Associated With Increased Risk of Shocks After Cardioverter Defibrillator Implantation (TOVA Study)

Jagmeet P. Singh, Murray A. Mittleman, Paul J. Wang, Jennifer C. Merlan, David Rich, James E. Muller, Jeremy N. Ruskin, Christine M. Albert, Massachusetts General Hospital, Boston, MA, Beth Israel Deaconess Medical Center, Boston, MA

Background: Although smoking is associated with increased incidence of coronary artery disease, there is a paucity of data examining its influence on the occurrence of ventricular tachyarrhythmias. **Methods and Results:** As a part of the TOVA (Triggers of Ventricular Arrhythmias) study, we prospectively analyzed the relationship between smoking status at baseline and subsequent risk of internal cardioverter defibrillator (ICD) discharges for ventricular tachycardia/ventricular fibrillation (VT/VF) among 861 ICD patients (mean age, 63 years). Over a mean follow up period of 421 days, 53 patients received ICD discharges for VT/VF. In univariate Cox models, smokers (n=265) had a 2.6 fold increased risk of ICD discharge for VT/VF (P=0.02), and this elevation in risk was essentially unchanged in multivariate models that controlled for age, sex, ejection fraction, history of prior ICD therapy and diabetes, (relative risk (RR) 2.6; 95% confidence interval (CI), 1.2 to 5.9). Further control for obesity, hypertension, beta-blocker use, angina, electrophysiologic study results and indications for implantation did not significantly alter these results. Both past smokers (n=193, RR 2.6, CI 1.1-5.9) and current smokers (n=72, RR 2.9, CI 1.0-8.8) were at an elevated risk of subsequent VT/VF, although power was limited to detect risk differences between current and past smokers

Conclusion: These prospective data suggest that smoking is a significant risk factor for ventricular arrhythmias in susceptible patients. Further prospective study is needed to assess whether smoking cessation will reduce the incidence of VT/VF in ICD patients.

1139-15 The Increase in Women Receiving Implantable Cardioverter Defibrillators: Changes in Characteristics or Indications?

Ralph J. Verdino, Joseph Poku, Andrea M. Russo, Dusan Z. Kocovic, Henry H. Hsia, David J. Callans, Edward P. Gerstenfeld, Matthew B. Hillis, David Lin, John F. Beshai, Francis E. Marchlinski, University of Pennsylvania Health System, Philadelphia, PA

Greater numbers of women are undergoing invasive cardiovascular procedures as indications have evolved. We sought to characterize the changes in women undergoing insertion of implantable cardioverter defibrillators (ICDs) over the past 15 years. We reviewed our records in 233 women of 980 total patients undergoing initial ICD implantation from the years 1986 to 2000. For the purpose of analysis, implant dates were divided into 3 time periods. Patient characteristics and indications for ICDs were indentified and compared. (See chart)

We conclude that patient characteristics (mean age, ejection fraction and disease process) of women patients undergoing ICD placement has not significantly changed over the past 15 years. However, women comprise a greater portion of ICD's patient implants, and undergo ICD implantation more often for arrhythmic risk or for symptoms presumed to be arrhythmic than earlier days of ICD implantation.

	86-90	91-95	96-00	p
total # women	31	34	178	
% of total implants	18.8	20.5	27.6	<0.05
mean woman age	56	58	61	n.s.
mean % EF	33	31	34	n.s.
% CAD	37	50	38	n.s.
% VT or VF	87	77	38	
% syncope	13	23	32	
% prophylaxis	0	0	30	

1139-16 A Moderate Scan Antitachycardia Pacing Protocol Is Superior to Burst or Ramp Stimulation

Rainer Schrepf, Hagen Gross, Marcus Leibig, Karl Theisen, Medical Clinic of the University of Munich - Innenstadt, Munich, Germany

Extensive testing of anti-tachycardia pacing (ATP) is outdated because the clinically relevant arrhythmia often is not inducible. Nowadays we usually program a standard stimulation sequence.

The aim of our randomized prospective crossover study was to compare moderate burst, scan and ramp protocols to define a first standard programming with a high success and low complication rate.

36 patients with a first implantation of an ICD were randomized to either a burst (coupling interval and cycle length 81%, 4 extra stimuli (ES) increasing to 7 ES), a scan (in addition a scan of 8 ms) or a ramp protocol (in addition a ramp of 8 ms). The recurrence of VT and the effectiveness of the ATP was registered by the device's Holter. Double crossover of the stimulation modalities was performed after nine and eighteen months. Statistical analysis was performed by SAS multivariate test.

Results: All patients completed the twenty seven months follow-up. We registered 202 episodes of sustained VT. 74 episodes were treated by a burst of which 63 were terminated by the first stimulation (85%), 7 were terminated by further stimulation. Four episodes needed a cardioversion after ineffective ATP. None of the patients showed tachycardia rate acceleration. 67 episodes were treated by a scan ATP with a first success rate of 88% (59 episodes). 8 needed further stimulation to be terminated but none of the patients was accelerated or needed a cardioversion because of ineffectiveness of the ATP. 61 episodes were treated by a ramp protocol. First success rate was 69% (42 episodes), acceleration occurred in 17 of which 6 were only terminated by a cardioversion. Two episodes needed a cardioversion because of ineffective pacing without prior acceleration through the ATP. Over all effectiveness of a scan stimulation was significantly higher than a burst ($p < 0.005$) or a ramp protocol ($p < 0.001$).

Conclusion: Moderate ATP with a coupling interval and a cycle length of 81% and a scan of 8 ms proved to be significantly more effective and less risky than comparable burst or ramp protocols.

1139-17 The Circadian Variation of Atrial Defibrillation Thresholds

Andrew R. Mitchell, Eduardo N. Warman, Katie Schaaf, Neil Sulke, Eastbourne General Hospital, Eastbourne, United Kingdom, Medtronic Inc., Minneapolis, MN

For the Worldwide Jewel AF-Only Investigators

Background: A circadian variation exists for ventricular defibrillation thresholds (DFTs) with a morning peak and a corresponding decrease in therapy success rates. Such a variation in atrial DFTs may have implications for the timing of internal and external cardioversion of atrial arrhythmias.

Methods: Data was collected as part of the worldwide Jewel AF study. Patients were selected if they had recurrent persistent AF and no history of ventricular arrhythmias. The atrial DFT was assessed at implantation of the device with a step-up protocol and was defined as the lowest energy to restore sinus rhythm. The atrial DFT was compared with time of testing for 100 patients (age 63.0±11.7, 74% male, EF 49.6±17.8, left atrial diameter 46±9mm).

Results The mean atrial DFT was 6.3±4.3J. Analysis of the atrial DFT for the most commonly tested lead configuration (right atrium to coronary sinus) in 56 patients, the DFT for the morning (3.3±1.5J) was significantly lower than the DFT measured in the afternoon (5.8±3.4J, p<0.01) and the DFT in the evening (7.4±5.9J, p=0.01).